

Claims

- [c1] 1. A power assisted, manually operated vehicle comprising of a propulsion device for moving said vehicle along a terrain, a manual operator adapted to receive a manual input force from an operator, a transmission operating said propulsion device from the force applied to said manual operator, a prime mover in driving relation with said propulsion device, a force sensor sensing the force applied to said transmission from said manual operator, an arithmetic calculator for measuring the variations in the sensed force by said force sensor and determining an assist force in operating said prime mover.
- [c2] 2. A power assisted, manually operated vehicle as set forth in claim 1, wherein the prime mover comprises an electric motor and the arithmetic calculator determines the amount of electrical power supplied to said electric motor.
- [c3] 3. A power assisted, manually operated vehicle as set forth in claim 1, wherein the manual operator is supported for movement about an axis.
- [c4] 4. A power assisted, manually operated vehicle as set

forth in claim 3, wherein the manual operator comprises a pedal.

- [c5] 5. A power assisted, manually operated vehicle as set forth in claim 1, wherein the manual operator provides a cyclically varying power output in response to a constant application of user force during a cycle of operation of the manual operator due to the nature of the manual operator and the arithmetic calculator provides an assist force that also varies cyclically but with a smaller amplitude than that of the manual operator.
- [c6] 6. A power assisted, manually operated vehicle as set forth in claim 5, wherein the arithmetic calculator provides an assist force that is never zero when a manual force is being applied.
- [c7] 7. A power assisted, manually operated vehicle as set forth in claim 6, wherein the arithmetic calculator provides an assist force that is also related to vehicle speed.
- [c8] 8. A power assisted, manually operated vehicle as set forth in claim 1, wherein the manual operator provides a cyclically varying power output in response to a constant application of user force during a cycle of operation of the manual operator due to the nature of the manual operator and at a portion of the cycle the power output is

zero even though a force is being applied and the arithmetic calculator provides an assist force that also varies cyclically but with a smaller amplitude than that of the manual operator and is never zero when a manual force is being applied.

- [c9] 9. A power assisted, manually operated vehicle as set forth in claim 8, wherein the detected torque is arithmetically processed in succession with predetermined decrease rates depending on the detected torque value at predetermined time intervals to obtain the processed torque value from the time when the detected torque value starts decreasing from a predetermined peak torque value.
- [c10] 10. A power assisted, manually operated vehicle as set forth in claim 8, wherein the arithmetic processing is suspended to make the amount of processing on the detected torque value zero from the time when said detected torque value starts to increase to exceed the processed torque value until the next peak in detected torque.
- [c11] 11. A power assisted, manually operated vehicle as set forth in claim 10, wherein the prime mover comprises an electric motor and the arithmetic calculator determines the amount of electrical power supplied to said electric

motor.

- [c12] 12. A power assisted, manually operated vehicle as set forth in claim 11, wherein the manual operator is supported for movement about an axis.
- [c13] 13. A power assisted, manually operated vehicle as set forth in claim 12, wherein the manual operator comprises a pedal.
- [c14] 14. A method of controlling the amount of power assist of a power assisted, manually operated vehicle comprised of a propulsion device for moving said vehicle along a terrain, a manual operator adapted to receive a manual input force from an operator, a transmission operating said propulsion device from the force applied to said manual operator, a prime mover in driving relation with said propulsion device, a force sensor sensing the force applied to said transmission from said manual operator, said method comprising the steps of measuring the variations in the sensed force by said force sensor, determining an assist force by arithmetically processing the detected torque value that varies at specific rates of change depending on the sensed force and applying a force from the prime mover based on the processing.
- [c15] 15. A method of controlling the amount of power assist

of a power assisted, manually operated vehicle as set forth in claim 14, wherein the manual operator provides a cyclically varying power output in response to a constant application of user force during a cycle of operation of the manual operator due to the nature of the manual operator and the assist force also varies cyclically but with a smaller amplitude than that of the manual operator.

[c16] 16. A method of controlling the amount of power assist of a power assisted, manually operated vehicle as set forth in claim 15, wherein the assist force is never zero when a manual force is being applied.

[c17] 17. A method of controlling the amount of power assist of a power assisted, manually operated vehicle as set forth in claim 16, wherein the assist force is also related to vehicle speed.

[c18] 18. A method of controlling the amount of power assist of a power assisted, manually operated vehicle as set forth in claim 17, wherein the detected torque is arithmetically processed in succession with predetermined decrease rates depending on the detected torque value at predetermined time intervals to obtain the processed torque value from the time when the detected torque value starts decreasing from a predetermined peak

torque value.

[c19] 19. A method of controlling the amount of power assist of a power assisted, manually operated vehicle as set forth in claim 18, wherein the arithmetic processing is suspended to make the amount of processing on the detected torque value zero from the time when the detected torque value starts to increase to exceed the processed torque value until the next peak in detected torque is sensed.

[c20] 20. A method of controlling the amount of power assist of a power assisted, manually operated vehicle as set forth in claim 19, wherein the prime mover comprises an electric motor and the arithmetic calculator determines the amount of electrical power supplied to the electric motor.